SECTION 15453

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES (Not Applicable)

1.3 SUBMITTALS

Refer to Section 15003, SD-10, 15, 16, 17, 20, 21, 22, 23, 30, 31, 32, 33, 34, 40, 41, 42, 43, 50, 56, 70, 76, 80, 90 and 92.

1.4 GENERAL REQUIREMENTS

Section 15003, "General Mechanical Provisions," applies to this section.

PART 2 PRODUCTS

2.1 PLUMBING FIXTURES AND FITTINGS FOR LABORATORY USE

2.1.1 General

Provide fixtures and trim design to prevent backflow of polluted water or waste into the potable water supply system. Make connections to sinks and similar fixtures including cup sinks absolutely gas tight and water tight with use of gaskets or other method acceptable to the Project Officer. Use of rubber gaskets or putty will not be acceptable for this purpose. Provide fixtures, trim and accessories of the quantity and in the manner shown on the drawings and necessary to properly install fixtures shown.

2.1.2 Eyewash:

Provide deck mounted type or wall mounted type on sink with twin stainless steel spray heads and stay open, pull type brass ball valve, HAWS 7650 (or 7651) or equal.

2.1.3 Emergency Shower:

Provide each laboratory containing a fume hood with an emergency shower just inside the doorway leading to the corridor. Provide emergency showers with stainless steel shower head where shown in the schedules on the drawings. Provide a shower head, quick opening, stay-open chrome plated brass ball valve, 150# 1-inch HAWS Co. assembly 8123H or equal with stainless steel pullrod and triangle handle.

2.1.4 Laboratory Service Fixtures and Connections:

Provide bench fixtures deck mounted except where otherwise noted. At all locations in laboratories where piping passes through unsleeved openings in bench top, filler panels, etc., exposed to view, install split ring escutcheons with chrome-plated finish to fit snug and secure. See NIH Standard Details Manual.

2.1.5 Traps:

Provide laboratory sinks, including cup sinks, with a heavy duty 1-1/2-inch, cast brass, adjustable, ground joint, swivel pattern "P" trap, with iron pipe size internal thread at outlet and slip joint at inlet. Furnish traps with a rough brass finish. Provide tailpiece extensions and install where required. Use extensions for cup sinks of lead tubing. Provide tubing with a shoulder on one end and connect to sink with heavy cast brass slip nut. Use tubing 1-1/2 inches O.D., 1/8-inch thick. Furnish extension pieces for all other sinks of 18 gage brass tubing.

2.1.6 Service cocks and faucets:

Furnish and install type and locate where noted on the drawings and as hereinafter specified. Provide metals and finishes for cocks, faucets, trimmings and fittings complying with applicable sections of WW-P-541. Service cocks and faucets of red metal with Grade R coating unless otherwise noted. Use faucets designed for a working pressure of 125 pounds. Use cocks and faucets of drop forged construction of cast brass suitable for such service; see the example listed in the schedule on the drawings. See NIH PEB Standard Details for configuration.

2.1.7 Handles of Service Cocks and Faucets:

Provide with removable colored plastic discs with identification of the service stamped in the disc as follows:

Service	Disc Color	Identification	Letter Color

Steam	Black	Steam	White
Gas, fuel	Blue	Gas	White
Air Compressed	Orange	Air	White
Vacuum	Yellow	Vac.	Black
Hot Water	Red	H.W.	White
Cold Water	Green	C.W.	White
Distilled Water	White	D.W.	Blue

2.1.8 Gas, Air, Vacuum Service Cocks for Laboratory Use:

Provide with extra heavy bodies of the ball flanged pattern, closely ground valve stems, stainless steel replaceable seats lever type handles. Valves shall permit easy adjustment without leaking. Furnish cocks with a 3/8-inch standard male pipe connections, and a ten serration hose connector of material identical to cocks, with exposed metal parts chrome-plated. Furnish service cocks, and mounting turrets manufactured by the Water Saver Faucet Company of Chicago, or of similar design and operation as indicated on the drawings.

2.1.9 Steam Cocks for Laboratory Use:

Provide with a ball flange base and ten serration hose connector as described above. Provide valve with a composition wheel handle. Furnish brass valves with polymerized tetrafluorethylene disc and removable monel seats designed for a steam working pressure of 150 pounds, with exposed metal parts chrome-plated.

2.1.10 All Hot and Cold Water Faucets for Laboratory Use:

Provide of material and identification required above. Furnish faucets of slow compression valve type with renewable and removable Renew-core devices with replaceable seats and washers, and fitted with four-ball wheel handles. Use chrome-plated exposed metal parts. Any water faucets that may be used with and extension hose provide a Watts NFL-9 back flow preventor or approved equal.

2.1.11 Faucets:

Install in accordance with schedule given on the drawings.

2.1.12 Faucet Hole Covers:

Provide on unused outlet holes in sinks, with covers of chrome-plated wrought

copper or cast brass, with suitable provision for securely mounting same to sink backs.

2.1.13 Fume Hood Fixtures:

Fume hood fixtures with remote controlled units, furnished by the Contractor. The Contractor shall make connections of utilities to the hoods (see the schedules on the drawings for required utilities). Hood details are available for review through the Project Officer.

Four-foot hood shall be equipped with a cup sink, serrated air, gas and vacuum cock and serrated cold water faucet on right vertical fascia panel. Six-foot hood shall be equipped with acup sink, serrated air, gas and vacuum cock and serrated cold water faucet on both vertical fascia panels.

Provide air, gas and vacuum valves of brass with stainless steel floating cones and removable stainless steel seats designed for a steam working pressure of 150 pounds. Provide brass cold water valves with soft rubber discs and removable seats, with valves body sturdily constructed and liberally proportioned to withstand operating strains. Furnish plug disc with a side seating surface, resistant to foreign matter, and removable type plug disc and seat. Furnish with deep stuffing box equipped with a gland, and filled with a high grade packing. Provide with four-ball wheel type handles with extension stem of ample size, substantially supported and provided with a bushing and escutcheon in the face of the corner post. Furnish handles, extension stems and trim chrome-plated, as noted above; with service identification on removable plastic discs as noted above.

2.1.14 Pedal Operated Foot Valve Cast Brass Floor Type, Pedal Operated Valve for Double Connection:

Furnish each double valve unit with heavy cast brass indexed pedals, a renewable self-closing control unit, loose key union angle stop with 3/8-inch female couple connection outlet, and a chrome seated brass mixing chamber. Provide chrome-plated exposed metal parts. See NIH Standard Detail P-105.

2.1.15 Knee Operated Valves:

Furnish knee touch push plate control valve with wall bracket (bracket not C.P.); a thermostatic temperature control valve for exposed piping to sense and correct temperature and pressure changes, to prevent water delivery above 115 degrees F. and shut-off delivery to sink upon failure of the cold water supply; a combination check and stop valve for hot and cold water supplies; 1/2 IPS brass supply piping. For knee touch and thermostatic valves, a #420-100 valve with #420-112 wall bracket and #423-2200 hydroguard mixing valve as manufactured by Power

Regulator Co. is representative of type valves intended to be covered by this specification.

2.1.16 At all locations in laboratories where piping passes through unsleeved openings in bench top, filler panels, etc., exposed to view, provide split ring escutcheons with chrome-plated finish, installed with a snug and secure fit.

2.1.17 Epoxy Sink:

2.1.17.1 Sinks shall be modified, oven-cured epoxy resin having the following properties:

Flexural Strength (ASTM Methods D790-49T)	19,300 psi
Hardness, Rockwell M (ASTM Methods D785-51)	114
Water Absorption % in 24 hrs. (ASTM D570-54)	0.05
Heat Distortion Temperature	350 F.

2.1.17.2 Sinks shall be non-glaring, black, and have generous coving in all corners and bottom, with a minimum of one degree dishing to outlet in bottom. Bowl shall be molded and backsplash molded with or cemented to bowl.

2.1.17.3 Sinks shall possess high resistance to mechanical and thermal shock.

2.1.17.4 A modified epoxy resin laboratory sink bearing the trade name DURCON, as manufactured by the Duriron Company, Incorporated, Dayton, Ohio is believed to meet the requirements of this specification. The intent here, however, is not to exclude others who can meet the specification.

2.1.17.5 Holes shall be drilled as detailed on the drawings. Drain spud hole shall be 2-inch diameter and have a rabbet to receive the spud lip. All holes required for sink assembly shall be backfilled with a black, acid-resistant cement.

2.1.17.6 Where proposals submitted under this specification indicate that equipment being offered differs in any way from the requirements stated herein, such as difference in gauges or size of materials, method of fabrication and assembly, the Government reserves the right to request manufacturer's shop drawings which show in detail the kinds of material, method of assembly and jointing, thickness and/or gauge of all parts for approval prior to award of contract. Such drawings shall be submitted in triplicate.

2.1.17.7 Workmanship shall be first class throughout. Sharp edges shall be broken and free from burrs. Exposed surfaces shall be uniformly smooth and without mold imperfections.

2.1.17.8 Tests and Test Reports - Sink supplier shall present to the Contracting Officer a certificate, from an independent testing laboratory approved by the Contracting Officer, stating that the sink material has been tested to and meets the properties and test requirements herein. No sinks shall be shipped until certificate has been received and approved by the Contracting Officer.

2.1.17.9 Chemical Resistance Tests - The following chemicals (1/2cc) shall be applied on a sample of the sink material at room temperature for 24 hours. The material shall withstand the chemicals to the extent shown.

CHEMICALS	EFFECT PERMITTED
Acetic Acid, Glacial	None
Sulfuric Acid 90%	None
Hydrochloric Acid 37%	None
Formic Acid 5%	None
Nitric Aid 70%	Slight Discoloration
Sodium Hydroxide 40%	Slight Dulling of Surface
Alcohol (methyl, ethyl, isopropyl)	None
Brine (saturated)	None
Ammonium Sulfate (Sat'd)	None
Ethyl Acetate	None
Formaldehyde 37%	None
Ethyl Ether	None
Chloroform	None
Acetone	None
Benzene	None
Toluene	
Glassware Cleaning Solution (98% Sulfuric Acid & Potassium dichromate)	Slight Dulling of Finish

2.1.17.19 The manufacturer shall upon request of the Contracting Officer provide a sample of equipment he intends to furnish, prior to award of contract. Such sample, if approved in all respects, may be accepted as part of any contract or order which may be executed.

2.1.17.11 Unless otherwise specified, final inspection of items furnished under this specification shall be after delivery to the Government, at the delivery destination specified in the contract or order.

2.1.17.12 Each item furnished under this specification shall be packaged and packed as a complete unit, and except where prohibited by packing limitations, each unit shall be assembled ready for use. Packing shall be suitable to prohibit damage under customary shipping, handling and storage procedures.

2.1.17.13 In addition to any other marking required for delivery purposes, or special marking required by the contract or order, the manufacturer shall label each shipping carton with the manufacturer's name and NIH stock number as shown on drawing to facilitate identification without opening the carton. In addition, each unit shall be stenciled or otherwise permanently identified on the rear with proper stock number before packaging.

2.1.17.14 The items covered by this specification are intended for general laboratory use, indoors, under the customary environment to be found in scientific laboratories of all types.

2.1.17.15 Procurement documents will specify the following:

(a) Title and date of this specification.
(b) Description of the unit and/or units to be ordered and appropriate item numbers as shown on drawing.
(c) Place of inspection, if other than at delivery destination (See 2.1.17.11)
(d) Special marking is required (See 2.1.17.13)
(e) Submittal of shop drawing(s) and/or sample(s) for approval of Contracting Officer prior to start of fabrication work.

NOTICE:

When Government drawings, specification, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

2.1.17.16 Drawings - Epoxy sink and drainboards are shown in the following list of NIH-PEB standard details. This specification covers only the procurement of the epoxy sink or drainboard selected from these details as indicated in the order; not to be included are plastic laminate work, pegboard, brackets, and sink stands (legs and aprons).

NIH-PEB Detail No.	Description
64	Epoxy drainboard 15" long
65	Epoxy drainboard 25" long
66	Epoxy drainboard 36" long
128	Epoxy sink 12" deep, 39" wide
129	Epoxy sink 18" deep, 39" wide
251	Epoxy sink 18" deep, 39" wide, w/2 drainboards
252	Epoxy sink 18" deep, x 24" wide

2.1.18 Cabinet Sink :

Cabinet sink shall be stainless steel sink with a base cabinet. Sink tops, drainboards, bowls, splashbacks, etc., shall be of sizes and details given on the drawings, and shall be fabricated as specified herein.

2.1.18.1 Top and drainboards shall be 16 gauge sound-deadened stainless steel reinforced with 14 gauge steel plates, stiffened with box and hat stiffening steel channels. Tops shall not sag, warp, or buckle. All corners shall be rounded to a smooth radius. Sharp corners will not be acceptable. The entire assembly shall be electrically welded together and all joints shall be ground and polished to provide a No. 4 finish over the entire assembly.

2.1.18.2 Sink bowls, rims and splashbacks shall be welded integral with the top and the drainboards. There shall be no visible seams, overlapping flanges, soldered joints or crevices. Sinks shall be die formed with all corners, both horizontal and vertical, rounded to a radius of not less than 15/16 inches. Sink bowls shall be made of 18 gauge stainless steel, thoroughly sound-deadened on the underside. Drainboards shall be made of 16 gauge stainless steel, pitched to the sink bowl and thoroughly sound-deadened on the underside.

2.1.18.3 Sink bowl shall be equipped with a drain outlet depressed and sized as shown.

2.1.18.4 All seams in stainless steel shall be welded by continuous seam Heliarc welding method, whereby welding shall be accomplished by deep penetration which fuses the mother metal to itself. Both welding arc and welding zone shall be shieled during welding by an inert gas such as Argon or Helium. Electrode used shall be of non-consumable type; none of the electrode metal shall be added to the weld. No welding rods shall be used. All welds shall be ground and thereafter passivated with nitric acid to condition the weld. No burrs or sharp metal edges or points shall be allowed.

2.1.19 Cup Sink :

Provide laboratory cup sink, acid resistant plastic or lead construction, with 1 1/2" drain connection and single cold water gooseneck faucet as shown on the drawings.

2.2 PLUMBING FIXTURES AND TRIM FOR NON-LABORATORY USE

Fixtures shall be furnished with the accessories for a complete installation, such as supply fittings, angle valves, escutcheons, couplings, nuts, drain fittings, and pop-up waste fittings, even if the accessories are not specifically called out herein. Rubber compression type connections are not acceptable and brass ferrule type fittings are required.

Vitreous-china and enameled cast-iron plumbing fixtures shall be the product of the same manufacturer, and unless otherwise specified, shall be white. The manufacturer shall be a company of established reputation in the manufacture of plumbing fixtures and one that assembles the plumbing outfits and assumes responsibility for all products supplied.

Exposed traps and double-cone supply tubes for fixtures and equipment shall be connected to rough-piping at the wall, unless otherwise specified.
Floor and wall plates shall be as specified herein or as covered by the outfit numbers.
Exposed-to-view fixture trimmings, fittings, and fasteners shall be chromium-plated or nickel-plated brass with polished, bright surfaces.

Exposed-to-view fixture supports shall be enameled iron to match the fixture.

Supplies and wastes for lavatories shall be to wall, except as otherwise indicated. Sleeves are not required at penetrations.

Each lavatory shall be fitted with a plunger-operated liquid-soap dispenser, unless otherwise indicated.

Ledge-back openings shall be located to place the faucet spout over the bowl drain.

2.2.1 Fixture Supports

Wall-hung fixtures shall be supported by ferrous-metal carriers. Where specified, carriers shall be combination type with adjustable fittings. Water closets and urinals shall have supporting feet not less than 10 inches long, unless construction requires shorter feet or bases.

Lavatories shall be supported from the wall by wall carriers with concealed arms.

Lavatories shall be supported by carriers with concealed adjustable arms and supporting feet not less than 10 inches long.

Supporting arms of slab-type lavatories shall be concealed by secure deep-drawn, chrome-plated covers.

Supporting feet shall have not more than 1-1/2 inches of concrete topping over structural slab for effective concealment.

2.2.2 Lavatories

Lavatories and fittings shall conform to FS WW-P-541/4.

Type L-S: Lavatories shall be Type V (slab type), Class 4 (wall hung), 20 by 18 inches. Inside opening shall be substantially rectangular.

Type L-B: Lavatories shall be Type I (straight back), 20 by 18 inches. Inside opening shall be substantially rectangular.

Type L-C: Lavatories shall be Type IV (countertop), Class 2 (oval), flat rim, beadless, self-rimming with rounded rim corner and back ledge, front overflow, oval shaped, seamless, and mirror finish. The materials shall be 18 gage, corrosion-resistant steel conforming to FS QQ-S-766, Class 302, A (annealed). The approximate internal size of the lavatory shall be 15-1/2 by 11-3/8 by 6 inches deep. Bowls shall be coated externally with sound deadening, nonmarring mastic.

Supply fittings shall conform to applicable requirements for faucets in FS WW-P-541/4.

The supply fitting shall be a 4-inch-center set type with a vandalproof aerator.

The supply fitting shall be a 4-inch-center set type with a universal joint aerator and pop-up waste assembly operator.

The supply fitting spout angle and length over the bowl shall provide a water-free back ledge. The horizontal distance from the centerline of the spoutless aerator to the centerline of the supply piping shall be not less than 4-3/8 inches, and the vertical distance between the centerline of the spout (less aerator) and the fitting base shall be not less than 2-1/2 inches. Supply fittings with handles capable of being turned 360 degrees are not acceptable.

Supply piping shall be chrome-plated brass, threaded in accordance with the requirements of FS WW-P-541/4.

Drain fittings shall conform to FS WW-P-541/4, strainer drain, unless otherwise specified, but with perforated removable strainer and 1-1/4-inch tailpiece. Adjustable P-trap, with cleanout, shall be Type I.

Corrosion-resistant steel lavatories shall be equipped with corrosion-resistant steel drain fittings.

Lavatory drain fittings shall be pop-up as specified in FS WW-P-541/4 with vandalproof, nonremovable stopper and pop-up assembly.

2.2.3 Service Sinks

Service sinks and fittings shall conform to FS WW-P-541/5.

Type SS-W: Service sinks shall be single bowl, mounting trap standard with high nondrilled back, and without a finished apron. The supply fitting shall be a 10-inch chrome-plated spout, Type SS-W, single, compression, with vacuum breaker and 4-foot hose with holding bracket. Supplies shall be chrome-plated brass without valves.

The waste shall be to the wall. The P-trap shall be cast iron with acid-resisting enamel inside, brass clean-out plug, and strainer.

Type SS-F: Service sinks shall be single bowl, mounting floor with high nondrilled back, floor-corner mounted, curved or straight front, and enameled cast iron with rim guard. The approximate size of the sink shall be 28 by 28 inches overall, 13 inches back height from the floor, and 6 inches deep. The supply fitting shall be single, compression, with vacuum breaker and 4-foot hose with holding bracket. The drain fitting shall be 3 inches, unless otherwise indicated.

Type SS-T: Service sinks shall be single bowl, three-side access, floor mounted, terrazzo, with four-side cap-tiling flange, and fabricated from Class 302, annealed corrosion-resistant steel. The approximate size of the fixture shall be 36 by 24 inches overall and 12 inches high. The supply fitting shall be a 10-inch spout, chrome-plated, single, compression with vacuum breaker and 4-foot hose with holding bracket. The drain fitting shall be 3 inches, unless otherwise indicated.

2.2.4 Urinals

Urinals and fittings shall conform to FS WW-P-541/2. Urinals shall be wall hung.

Flushing devices shall be exposed flushometer, with side oscillating handle.

Type UR-W: Urinals shall be bowl type, with integral trap and extended shields, washout flush, back connected, wall hung, with flush valve.

The flush valve shall be a concealed rough-brass, large-diaphragm, wall-mounted, externally adjustable, foot-pedal-operated type, with 1-inch, wheel-handle stop, 1-inch inlet and outlet pipe connections, screwdriver stop and vacuum breaker. All exposed parts shall be chrome-plated, except that a 6-inch-diameter, 16-gage, corrosion-resistant steel kick plate conforming to FS QQ-S-766, Class 302, annealed, shall be provided beyond the normal escutcheon plate or integral-finish flange. An elbow flush connection for the 3/4-inch concealed back spud shall be provided.

The piping connection between the flush valve and urinal shall be 1 inch, Schedule 40, red-brass pipe conforming to FS WW-P-351, with fittings conforming to FS WW-P-460. Fittings shall be brazed type wherever possible.

2.2.5 Wash Sinks

Wash sinks and fittings shall conform to FS QQ-S-766.

Type WS-SS: Wash sinks shall be single bowl, flat iron, beadless, self-rimming, ledge back, rounded-rim corner, with 2-1/2-inch (maximum) bowl-bottom radius, seamless, and a mirror finish. The material shall be 18-gage, corrosion-resistant steel conforming to FS QQ-S-766, Class 316, annealed. The approximate size of the sink shall be 24 by 20 inches overall, 21 by 17 inches inside bowl, and 6-1/2 inches deep. The bowl shall be coated with sound-deadening, nonmarring mastic. The edge-back punchings shall be compatible with supply fitting. The location shall center the spout length over the bowl opening.

The bowl and waste fitting shall be suitable for front overflow.

The supply fitting shall conform to FS WW-P-541/4.

The supply fitting shall be either a gooseneck type with universal-joint aerator, single hole, deck mounted, and heavy-duty lever or shall be single-hole, deck-mounted type, with a 12-inch swing spout, universal-joint aerator, and heavy-duty lever as indicated.

The supply fitting shall have either a spray attachment with 48-inch hose or shall have spray and wash-brush attachments, each with a 48-inch hose as indicated.

The liquid soap dispenser shall be chrome-plated brass or plastic with not less than 3-1/2-inch spout-to-shank dimension and not less than a 12-ounce plastic soap container which shall be refillable upon removing a pushbutton cap or head assembly.

The waste fitting shall be either a flat strainer with drain plug or shall be a cup strainer with drain plug or shall be pop-up type with ledge-back-mounted operator fabricated from AISI 300 series corrosion-resistant steel as indicated.

P-traps shall be 1-1/2-inch corrosion-resistant steel or heavy-duty cast brass or cast bronze, adjustable, with cleanout.

2.2.6 Water Closets

Water closets shall conform to FS WW-P-541/1.

Type WC-Q: Water closets shall be office and industrial, elongated bowl with flush valve, syphon-jet, wall outlet, and constructed for quiet operation. The seat shall be elongated open front, solid molded high-impact polystyrene, with check hinge, and without a cover. The flush valve shall be exposed, with vacuum breaker and screwdriver stop, constructed for quiet operation.

The women's room outfit shall be identical to Type WC-Q, except that the seat shall be open front with cover. A bumper shall be provided on the flush valve.

2.2.7 Shower Fittings

Shower fittings shall conform to FS WW-P-541/7 with concealed piping and pressure-balancing mixing valve. The shower head shall be Type I, Class 2 (adjustable).

2.3 SANITARY DRAIN, WASTE, AND VENT FIXTURES

Sanitary drain, waste, and vent fixtures shall be Type GCS-DWV, of galvanized carbon steel.

2.3.1 Floor Drains

Floor drains shall be complete with traps, unless otherwise specified or indicated.

Floor drains located in slabs on earth shall have hub outlets; those in slabs not on earth shall have threaded outlets or hub outlets, as required to match piping used.

Floor drains shall have bottom outlets, unless otherwise specified or indicated.

Floor drains shall have integral seepage pans and weep holes, unless otherwise specified or indicated.

Floor drains fitted with membrane or metal pan waterproofing shall have clamping collar assemblies.

Hopper drains shall be provided with grates, unless otherwise specified or indicated.

Ferrous floor drain surfaces, except the top of grates, shall be given a heavy coating of coal-tar enamel, unless otherwise specified or indicated.

The coating shall be applied either at the factory or in the field before installation and before rusting has occurred.

Hopper drain strainers and hoppers, where indicated, shall be coated with acid-resistant enamel in conformance with FS WW-P-541 and ASTM C282.

Trap primers shall be all bronze with nonferrous trim floor. Drains shall be fitted with cast-iron primer adapters.

The floor drain body and its standard specification strainer shall be tested in compression, while loaded with a 120,000-pound-capacity hydraulic machine, by means of a 2-1/2-inch square, 1-inch thick platen placed at the geometric center of the strainer. Deflection measurements from the bottom of the platen shall be taken using a deflection gage graduated in 0.001-inch increments. Cast-iron strainers shall be loaded as rapidly as possible; load-to-failure should be applied within 2 to 2.5 seconds, and maximum deflection at failure by cracking shall be noted. Ductile-iron and nonferrous strainer permanent deformation shall constitute failure. These strainers shall be loaded to a deflection of 1/16 inch without permanent deformation and to a deflection of 1/8 inch, at which or before which, permanent deformation will occur.

FD-1: Floor drains shall conform to ANSI A112.21.1M, shower-drain type with nonferrous sediment bucket, and to the requirements specified herein. The

adjustable collar, strainer, and fasteners shall be nickel-bronze; exposed-to-view surfaces shall be satin polished. The strainer holes shall be square and strainer diameter shall be nominal 5 inches. The strainer and body shall be capable of sustaining a platen load of not less than 2,000 pounds with not more than a 1/16-inch, nonpermanent deflection when load is applied within 5 seconds. The strainer free area shall be not less than 7 square inches.

FD-2: Floor drains shall conform to ANSI A112.21.1M, shower-drain type, and to the requirements specified herein. The adjustable collar, strainer, and fasteners shall be nickel-bronze; exposed-to-view surfaces shall be satin polished. The strainer holes shall be square and strainer diameter shall be nominal 5 inches. Strainer and body shall be capable of sustaining platen load of 2,000 pounds at 1/16 inch maximum nonpermanent deflection when load is applied within 5 seconds. The strainer free area shall be not less than 7 square inches.

FD-3: Floor drains shall conform to ANSI A112.21.1M, shower-drain type, and to the requirements specified herein. The adjustable extended collar or rim, strainer, and fasteners shall be nickel-bronze; exposed-to-view surfaces shall be satin polished. The strainer diameter shall be a nominal 7 inches. The rim depth to the strainer shall be approximately 3/4 inch, and the free area shall be approximately 13 square inches.

FD-4: Floor drains shall conform to ANSI A112.21.1M, shower-drain type, and to the requirements specified herein. The adjustable collar or rim, strainer, and fasteners shall be nickel-bronze; exposed-to-view surfaces shall be satin polished. The strainer diameter shall be a nominal 7 inches with an approximately 3-1/2-inch-high, 4-inch top opening funnel. The free area shall be approximately 4-1/2 square inches.

FD-5: Floor drains shall conform to ANSI A112.21.1M, area-drain type, and to the requirements specified herein. The strainer and body shall be capable of sustaining a platen load of not less than 4,000 pounds, applied within 2 seconds, before failure. Cracking of the strainer or body shall be considered as failure. The strainer free area shall be not less than 14 square inches.

FD-6: Floor drains shall conform to ANSI A112.21.1M, area-drain type, and the requirements specified herein. The strainer shall be deep flanged, tractor type. The strainer and body shall be capable of sustaining a platen load of not less than 8,000 pounds, applied within 3 seconds, before failure. Cracking of the strainer or body shall be considered as failure. The strainer free area shall be not less than 17 square inches.

FD-7: Floor drains shall conform to ANSI A112.21.1M, area-drain type, and the requirements specified herein. The strainer diameter shall be a nominal 10 inches with a free area not less than 26 square inches. The strainer and body shall be capable of sustaining a platen load of not less than 10,200 pounds, applied within 3.8 seconds, before failure. Cracking of the strainer or body shall be considered as failure. An identical pattern ductile-iron strainer may be provided in lieu of cast iron when so specified.

FD-8: Areaway drains shall conform to ANSI A112.21.1M, area-drain type, plain pattern, bottom outlet, except that strainer shall be domed.
FD-9: Areaway drains shall conform to ANSI A112.21.1M, area-drain type, plain pattern, with bottom outlet.

FD-10: Floor drains shall be cast iron, double-drainage pattern, hopper type, conforming to requirements specified herein, and shall have a dome type strainer in the bottom of the body.

Hopper drains shall be either round with nominal 12-inch diameter, or square with nominal 12-inch sides as indicated.

Interior drain surfaces shall be coated with acid-resistant enamel.

2.3.2 Interceptors

Interceptors shall conform to requirements indicated.

2.3.3 Trench Drains

Trench drains shall conform to requirements indicated.

2.3.4 Roof Drains

Type RD-A: Roof drains shall be heavy pattern, all cast-iron construction with integral clamping surfaces not less than 2 inches wide, which includes a clamping ring and gravel guard where necessary. Beehive- or dome-shaped strainer diameter shall be approximately 12 inches and height shall be not less than 5 inches. Open area of the strainer shall be not less than twice the area of the nominal drain outlet. The drain body and bolting shall be corrosion-protected with manufacturer's standard enamel and electrodeposited coating.

Roof drains shall have an integral expansion joint of proper size to receive the leader pipe. The expansion joint shall be heavy cast bronze, sleeve type,

constructed to form a watertight, flexible joint.
The metal of the sleeve shall have a nominal thickness of not less than 0.134 inch.

Packing shall be of lubricated asbestos fiber, soft lead, or other similar, durable material, and shall not be located in the flow line of the drainage. Bronze wing nuts and bolts or other nonferrous metal devices shall be provided for tightening or replacing the packing without disturbing the leader-pipe connection to the drain. Roof integrity shall be protected by inline expansion joints and piping configuration indicated.

Type RD-CR: Roof drains shall be heavy pattern, cast-iron-body construction with integral clamping surfaces not less than 2 inches wide, including clamping ring and dome-shaped strainer with weir and gravel guard where necessary. The strainer shall be aluminum construction. The weir shall provide controlled runoff at adjustable flow rates proportional to the head. The drain body and bolting shall be corrosion protected with the manufacturer's standard enamel and electrodeposited coating.

Roof drains shall prevent water accumulation on the roof from exceeding 3 inches or 15.6 pounds per square foot load.

Roof drains shall have an integral expansion joint of proper size to receive the leader pipe. The expansion joint shall be heavy cast bronze, sleeve type, constructed to form a watertight, flexible joint.

The metal of the sleeve shall have a nominal thickness of not less than 0.134 inch.

Packing shall be of lubricated asbestos fiber, soft lead, or other similar durable material, and shall not be located in the flow line of the drainage. Bronze wingnuts and bolts or other nonferrous metal devices shall be provided for tightening or replacing the packing without disturbing the leader-pipe connection to the drain. Roof integrity shall be protected by inline expansion joints and the piping configuration indicated.

The weir shall be factory adjusted and locked into the maximum flow position.

2.3.5 Drainage System Expansion Joints

Expansion joints shall be heavy cast-bronze sleeve type, constructed to form a watertight flexible joint. The metal of the sleeve shall have a nominal thickness of not less than 0.134 inch. Packing shall be of lubricated asbestos fiber, soft lead, or other similar durable material and shall not be located in the flow line of the

drainage. Bronze wingnuts and bolts or other nonferrous metal devices shall be provided for tightening or replacing the packing without disturbing the leader-pipe connection to drain.

2.3.6 Cleanouts

Cleanouts shall be gastight and watertight and sized to provide quick and easy access for plug removal and rodding tools. Cleanouts shall be aesthetically located with respect to tile patterns, masonry bond, and alignment.

Cleanouts in ceramic tile, resilient tile flooring, and finished walls shall be rectangular.

No cleanout plug shall terminate in or above a finished floor or wall surface, except in stack bases and where indicated.

Access to foundation tile drainage lines in floors shall be as indicated.

Cleanouts shall have cast-brass raised-head plugs, unless otherwise specified or indicated. SD-83, Not less than two tools for each size and type plug shall be delivered to the Contracting Officer.

Cleanout plugs under pressure, and where specified, shall be lead gasketed.

Cleanouts in aboveground floors shall have integral seepage pans and weep holes.

Cleanouts fitted with membrane or metal-pan waterproofing shall have integral seepage pans and weep holes and clamping collar assemblies.

Cleanouts set outside of the building and cleanouts in building floors shall have adjustable housings, unless otherwise specified or indicated.
Cast-iron bodies shall be coated with manufacturer's standard material.

Type CO-1: Cleanouts shall have a cast-iron body and a setscrew adjustable housing with deep-set tractor-type, cast-iron, scoriated cover.
Construction shall be heavy duty and suitable for AASHTO H-10 loading.

Type CO-2: Cleanouts shall have a cast-iron body and setscrew adjustable housing with deep set, tractor-type, polished nickel-brass or nickel-bronze, scoriated cover.
Construction shall be heavy duty and suitable for AASHTO H-10 loading.

Type CO-3: Cleanouts shall have a cast-iron body and adjustable housing with

polished nickel-brass or nickel-bronze heavy-duty frame, and scoriated, secured cover. The cover thickness shall be not less than 3/8 inch.

Type CO-4: Cleanouts shall have a cast-iron body and adjustable housing with cover recessed to a depth to accommodate specified resilient flooring material. Surfaces and fasteners exposed to view shall be constructed of polished nickel-bronze or approved nickel-brass.
Type CO-5: Cleanouts shall have cast-iron body and adjustable housing with 3/4-inch minimum recessed anchor cover. Surfaces and fasteners exposed to view shall be constructed of nickel bronze or approved nickel brass. The cover shall be fitted with a lifting screw.
Type CO-6: Cleanouts shall have cast-iron cleanout tees with lead-gasketed plugs.

2.3.7 P-Traps

P-traps shall be extra-heavy cast iron conforming to FS WW-P-401.

PART 3 EXECUTION

3.1 NSTALLATION

Materials, equipment, and fixtures shall be installed as indicated and specified and in accordance with the manufacturer's recommendations.

Installation of plumbing fixtures shall conform to the published or written instructions of the manufacturer for the specific project application, except as otherwise specified herein.

Fixtures shall be clean and free of deleterious material before being installed. Before connecting to water, waste, vent or trap service, the fixture lines shall be blown out with compressed air. During the progress of construction, open ends of fixtures shall be protected at all times to prevent the admission of foreign matter.

3.2 TESTS

Leak tests shall be conducted in accordance with IAPMO UPC, except as otherwise provided herein. Tests shall be hydrostatic, unless otherwise specified. Only potable water shall be used for testing. The Government will supply the test water, but the Contractor shall be responsible for approved disposal of contaminated water. The duration of the test will be determined by the

Contracting Officer, who may also terminate the test at any point after it has been determined that fixtures are watertight.

SD-70, The record of testing shall be maintained by the Contractor and shall be submitted to the Contracting Officer upon acceptance of the equipment by the Government.

*** End of Section ***